New Hampshire Climate Change Policy Task Force
Draft Action Reports under Development

Energy Generation and Use (EGU)
Working Group

Prepared by NHDES
September 8, 2008

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Energy Generation and Use (EGU)

EGU Action 1.1 – Revenue Decoupling

Summary

Revenue decoupling is a rate mechanism that could remove obstacles to increasing energy efficiency activities by utilities. Full revenue decoupling makes utility distribution revenues completely independent of sales volumes, thereby removing a utility's disincentive to sell more energy in order to increase profits. Advocates of decoupling believe that it is a necessary ingredient to obtain strong utility support for energy efficiency. Most agree that decoupling, which only removes disincentives to utilities for energy efficiency, should be combined with positive performance incentives to assure maximum utility support for energy efficiency.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): Full revenue decoupling makes a utility's distribution revenues completely independent of sales volumes. A commonly used mechanism is to reconcile actual distribution revenues to the revenue level allowed in a revenue requirements (rate case) proceeding. The decoupling reconciliation is symmetrical – adjustments can take the form of credits or charges depending on whether actual revenue levels exceed or are less than the allowed revenue level. The specific details and implementation of a decoupling mechanism for each utility must be determined in proceedings before the Public Utilities Commission. Note that under traditional regulation, load growth provides an opportunity for increased distribution revenues from year to year, an arrangement which full decoupling would eliminate. Thus, under full decoupling, it may be necessary to provide for revenue increases over time through a rate plan that includes adjustments for inflation or other factors, or that uses projected costs for a future annual period for the purpose of setting rates, rather than the traditional practice in New Hampshire of basing rate level on an historical annual period.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)

   a. *Method of Establishment (e.g., legislation, executive order):* The Public Utilities Commission (PUC) currently has an open docket to consider implementing rate mechanisms such as revenue decoupling for NH utilities. (Docket No. DE 07-064, opened May 14, 2007). Full decoupling is generally implemented as part of a multi-year rate plan so that the utility is insulated from inflationary cost increases that would otherwise be recovered through increased revenue from normal sales growth.

   b. *Resources Required:* To implement a new rate mechanism, utilities and other interested parties must participate in a litigated docket (or several dockets) at the PUC. Each year, or every few years, there would likely be proceedings to review the mechanism and to make any necessary reconciliation.

   c. *Barriers to Address (especially for medium-to-low feasibility actions):* There is a general recognition that decoupling alone, which removes a disincentive for utilities to support energy efficiency, does not provide a positive incentive for new energy efficiency programs by itself. It has been suggested that decoupling shifts some risk from utility shareholders to customers and would therefore justify lower rates of return for utilities. Conversely, full decoupling in the absence of either a multi-year rate plan or the use of a future period for rate setting purposes could increase risk for a utility.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)

   a. *Parties Responsible for Implementation*: Public Utilities Commission, regulated electric and natural gas utilities.

   b. *Parties Paying for Implementation*: Customers would experience additional charges or credits on bills.

   c. *Parties Benefiting from Implementation*: All citizens benefit if decoupling results in more energy efficiency – utilities and consumers (customers) benefit through greater certainty, consumers bear less risk that utilities will collect more than the allowed revenue, and utilities bear less risk that collected revenue will fall short of allowed revenue. These benefits will accrue provided that appropriate mechanisms are in place for periodic review by the PUC and provided that utilities are protected from inflationary cost increases upon implementation of the revenue decoupling mechanism.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): Today, New Hampshire has utility-administered energy efficiency programs funded by customers through the System Benefits Charge (SBC) on electric bills and through a charge included in gas rates. Included in those programs, in addition to recovery of all prudently incurred costs, are monetary incentives paid to the utilities if performance goals are achieved in the implementation of the programs. However, under the current system, utilities in New Hampshire still have a financial incentive to maximize sales.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)
   a. *Existing*: See Item 4 above.
   b. *Proposed*:
      i. EGU Action 1.2 – Energy Efficiency Procurement Energy Efficiency Procurement: In this policy, each electric and natural gas distribution company would be required to increase investments over a reasonable period of time in energy efficiency and demand reduction programs to capture all cost-effective investments (i.e., those available at lower cost than supply) that are reliable and feasible on behalf of all customers. The energy cost savings potential of this policy could be realized with the assistance of a revenue decoupling mechanism (EGU Action 1.1 – Revenue Decoupling) that makes utility distribution revenues completely independent of sales volumes, thereby removing a utility's incentive to boost profits by selling more energy.
      ii. SB451: This legislation would provide a framework for utility investments in distributed energy resources, including energy efficiency, by allowing a utility to include the costs of such investments in rates if the utility can show a benefit to all customers.

6. Timeframe for Implementation: A PUC docket is underway; implementation could be as early as 2009.

7. Anticipated Timeframe of Outcome: See above.

<u>Program Evaluation</u>

In the context of the Climate Change Action Plan, decoupling should be viewed as a complementary mechanism that enables utilities to support a variety of customer-side initiatives, including efficiency, demand response, and combined heat & power, all of which reduce energy consumption. By itself, decoupling is intended to be a neutral mechanism which ensures that the utility will recover no more and no less than its allowed distribution revenues and therefore imposes no incremental costs on society. By providing this assurance, decoupling removes a powerful corporate incentive to maximize sales but does not necessarily increase utility investments in energy efficiency.

The evaluation of the decoupling mechanism should be based on whether it effectively achieves these objectives at reasonable administrative costs with minimal disruption to customers.

The energy savings and emission benefits of revenue decoupling, considered by itself and separate from any specific program incentives to increase energy efficiency, are not directly quantifiable. The magnitude of customer benefits will depend on the nature and investment levels of the specific programs adopted for reducing energy consumption and emissions.

1. Estimated CO_2 Emission Reductions: Emissions for this action are not separately quantified but are included as part of EGU Action 1.2.

2. Economic Effects
   a. Costs
      i. Implementation Cost: Low
      ii. Timing: Constant / even
      iii. Impacts: State government ***(due to administrative costs)***
   b. Savings: Not directly quantifiable; proposed action is a supporting mechanism.

3. Other Benefits/Impacts

    a. *Environmental:* Improvements in energy efficiency will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

    b. *Health:* Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

    c. *Social:* Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce "green" jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

    d. *Other:* Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles, and opportunities*)

    a. *Technical*: Revenue decoupling can be implemented relatively easily once the PUC determines appropriate policies.

    b. *Economic*: Decoupling will have a positive impact on utilities and, if combined with incentives for energy efficiency, will promote economic activity in the energy efficiency industry and reduce consumers' energy costs over reasonable payback periods.

    c. *Statutory/Regulatory*: The PUC has the authority to approve decoupling.

    d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note: Revenue decoupling must be combined with incentives for utilities to place greater emphasis on energy efficiency activities if the full benefits of decoupling are to be realized. California has had revenue decoupling in place for most of the past 25 years. There, the decoupling mechanism is generally accepted as a way to make the state's electric utilities indifferent to sales levels. Decoupling has had only small impacts on rate volatility. Analyzing ten years' worth of decoupling data, a 1994 U.C. Berkeley study concluded that "decoupling has had a negligible effect on rate levels and has, for [one of the three utilities analyzed], actually reduced rate volatility."[1]

6. Level of Group Interest:

7. References:

[1] Joseph Eto, Steven Soft, and Timothy Belden, *The Theory and Practice of Decoupling*, Lawrence Berkeley Laboratory, University of California, January 1994, Report LBL-34555, UC-350 at 46. The cited excerpt of this report is attached hereto as Ex. A. The full report has been filed electronically, and is on file with ENE and available upon request.

EGU Action 1.2 – Energy Efficiency Procurement

Summary

A combination of statutory limits on investment levels and the manner in which utilities recover energy efficiency costs currently restrict the size of investments by electricity and natural gas distribution companies in energy efficiency. This proposal – also known as Least-Cost Procurement, or LCP – would improve the way New Hampshire utilities invest in efficiency programs that cost a fraction of the price of energy supply. Utilities would be required by the PUC to purchase cost-effective "demand-side" resources like energy efficiency and demand response which are less expensive than the price of energy supply. A new Energy Efficiency Advisory Council composed of consumer, environmental, and state agency representatives would work with the utilities on identifying all cost-effective investments in energy efficiency and in the planning and design of such programs. The Council will increase utility accountability while leaving responsibility for final regulatory approval with the PUC.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): Each electric and natural gas distribution company would be required to increase investments over a reasonable period of time for any qualifying investment in energy efficiency and demand reduction programs with the goal of capturing all cost-effective investments (i.e., those available at lower cost than supply) that are reliable and feasible on behalf of all customers. Every two or three years, each utility would develop an Efficiency Investment Plan that identifies the efficiency programs and annual budget amounts required to expand its procurement of demand-side resources to meet the all cost-effective standard. The utilities would first seek input on the plan from a new Energy Efficiency Advisory Council representing residential customers, business consumers, environmental interests, and state agencies. The utility would then develop its plan, taking into account the input received from the Energy Efficiency Advisory Council; and the plan would be submitted to the PUC for review and approval. The efficiency programs would continue to be implemented by the utilities and their contractors. The Efficiency Investment Plan would identify existing funding sources such as the System Benefits Charge (SBC) and other funding sources and program investment needs.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)

   a. *Method of Establishment (e.g., legislation, executive order):* PUC Order.

   b. *Resources Required:* Efficiency resources would be procured with funds from the existing System Benefits Charge (which would be considered a minimum funding level at $1.8 mills per kWh), the forward capacity market, emissions allowances, or other funding sources, with any additional program investment needs recovered through delivery charges. Distribution companies would recover their costs, as incurred from year to year, in implementing these expanded energy efficiency programs; and customers would realize almost all of the savings.

   c. *Barriers to Address (especially for medium-to-low feasibility actions):* Electric and gas distribution companies currently recover most fixed distribution costs through volumetric (kWh or ccf) charges that create an incentive for the utility to maximize sales and thus under-invest in cost saving demand resources. To remove this disincentive for investments in energy efficiency and distributed generation, regular true-ups in rates should be established to ensure that any fixed-costs recovered through volumetric charges are not dependent on sales volumes (see EGU Action 1.1 – Revenue Decoupling). The PUC should also conduct a proceeding to establish a performance-based incentive plan for implementation of efficiency programs tied to success in implementing programs that maximize cost-effective energy savings for customers.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)

   a. *Parties Responsible for Implementation*: The PUC and utilities serving New Hampshire customers.

   b. *Parties Paying for Implementation*: All customers.

c. *Parties Benefiting from Implementation*: All customers; companies that design, install, and service energy efficiency measures.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*)
   a. New Hampshire CORE programs funded by the Systems Benefits Charge
   b. Energy Efficiency and Sustainable Energy Advisory Board, created by HB1561.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)
   a. *Existing*
   b. *Proposed*
      i. EGU Action 2.2 – Regional Greenhouse Gas Initiative (RGGI): Emission reductions from LCP would be a portion of the reductions attributable to RGGI and should not be double counted; but LCP could make RGGI compliance easier, such that a more stringent post-2018 phase of RGGI could be created.
      ii. EGU Action 1.1 – Revenue Decoupling.

6. Timeframe for Implementation: Building on legislation established in other Northeast States, a bill for energy efficiency procurement could be introduced in the next legislative session.

7. Anticipated Timeframe of Outcome: 2010 and thereafter.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Reduction in NH Energy Consumption by 2020	**CO_2 Emission Reductions**		
	2012	**2025**	**2050**
5%	0.08	0.29	0.38
10%	0.17	0.59	0.76
15%	0.25	0.88	1.14
20%	0.33	1.17	1.52
24%	0.40	1.41	1.83

2. Economic Effects
   a. Costs
      i. Implementation Cost:

Reduction in NH Energy Consumption by 2020	**Relative Cost**
5%	Moderate
10%	Moderate
15%	Moderately High
20%	Moderately High
24%	Moderately High

      ii. Timing: Immediate / higher initial costs
      iii. Impacts: Evenly distributed

b. Savings

i. Potential Economic Benefits:

Reduction in NH Energy Consumption by 2020	Relative Benefit
5%	Moderately High
10%	High
15%	High
20%	Very High
24%	Very High

ii. Timing: Low short-term / mostly long-term

iii. Impacts: Evenly distributed

3. Other Benefits/Impacts

a. *Environmental*: Improvements in energy efficiency will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce “green” jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)

a. *Technical*: There is high potential for energy efficiency procurement because cost-effective energy efficiency measures and technology are available but have not been fully deployed in New Hampshire to date.

b. *Economic*: There is high potential because the current costs of readily identifiable energy efficiency resources are about one-fourth the costs of energy supply.

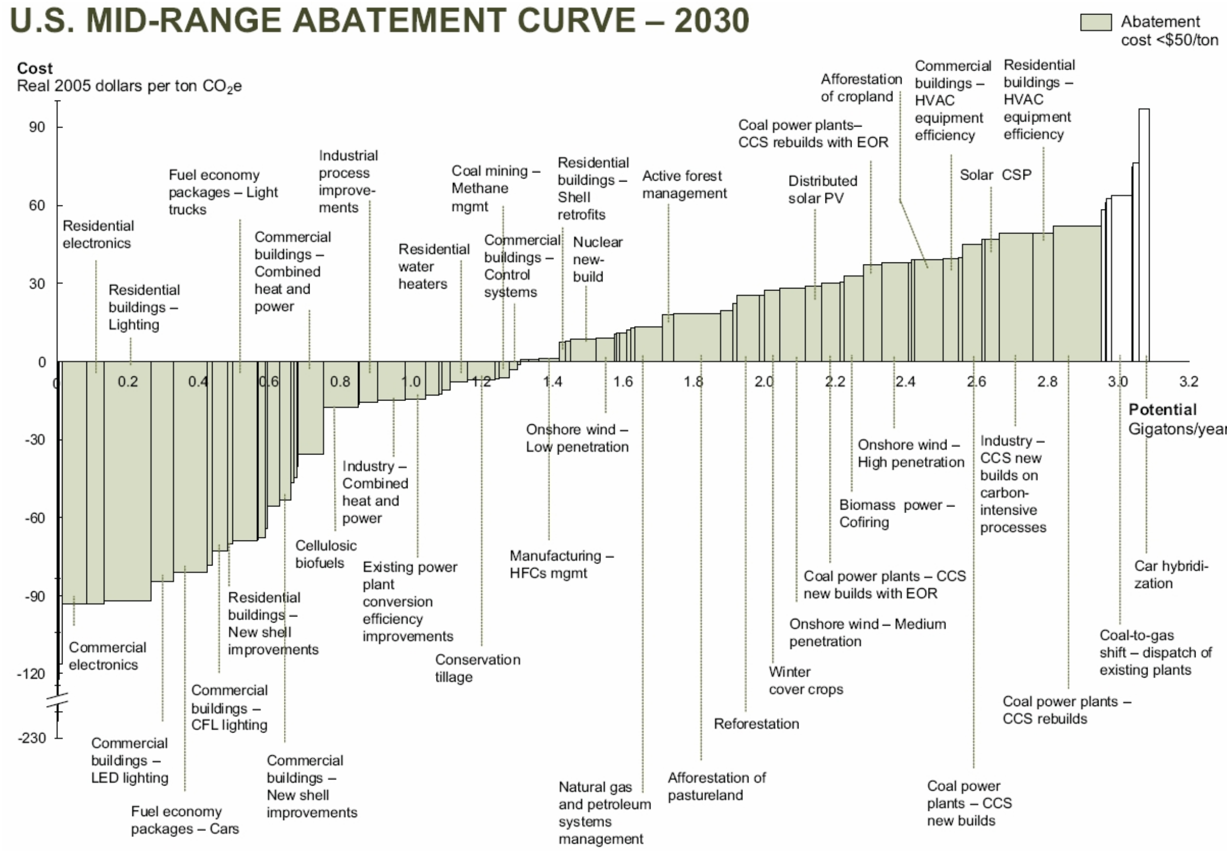
c. *Statutory/Regulatory*: There is high potential because other states have led the way in this area.

d. *Social:* Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note:

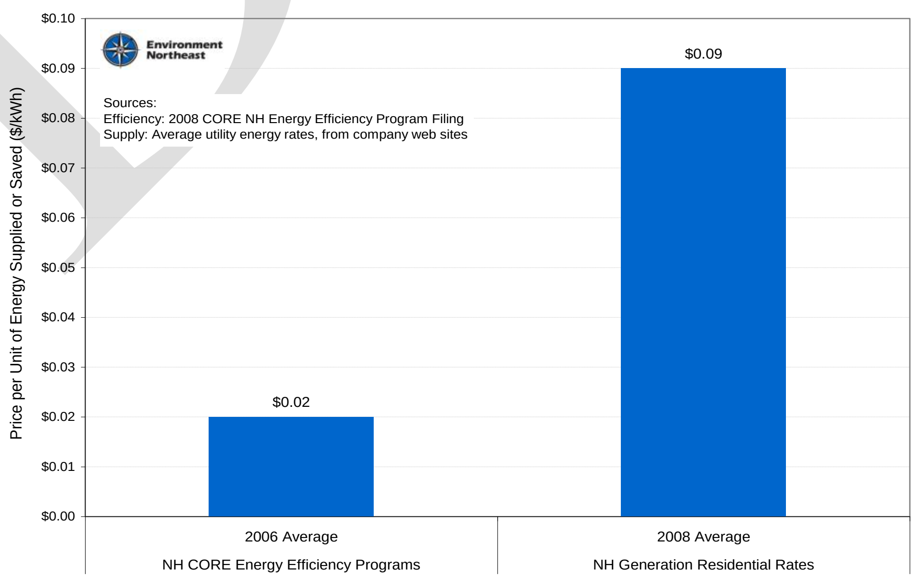
a. Based on previous experience in New Hampshire and other Northeast States, efficiency programs save about four dollars for every dollar invested. Energy savings to consumers from these programs replace expenditures on fossil fuels, and those savings become available to other parts of the economy. The benefits have a compounding effect: Local energy service jobs are created, power plant emissions are reduced, demand for new generating facilities is relieved, and carbon cap-and-trade programs are able to be implemented at lower cost.

b. *Energy Efficiency Investments Save Money While Reducing Emissions:* The following recent graphical analysis from McKinsey illustrates which technology options are available to reduce emissions at what cost. Most energy efficiency investments save money while supply investments cost money.



Source: McKinsey analysis

c. *Generation vs. Efficiency Prices:* This chart from Environment Northeast compares the average price of New Hampshire CORE electric energy efficiency programs with the average residential price of electric supply.



6. Level of Group Interest:

7. References:

- Northeast Energy Efficiency Partnership**,** *Economically Achievable Energy Efficiency Potential in New England*, http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf
- McKinsey & Company, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?*, http://www.mckinsey.com/clientservice/ccsi/greenhousegas.asp
- ACEEE, *Energy Efficiency: The First Fuel for a Clean Energy Future*, http://aceee.org/pubs/e082.htm.
- Maryland legislation HB 374, http://mlis.state.md.us/2008rs/billfile/HB0374.htm.

EGU Action 1.3 – Combined Heat & Power Resource Standard

Summary

Combined heat & power (CHP, also known as cogeneration) is the use of an on-site power plant or boiler to generate both electricity and useful heat simultaneously. This technology may be applicable where a thermal load (e.g., for space heating or industrial process heat) already exists or is planned. CHP would be appropriate for new boilers and for retrofits of existing boilers using cleaner-burning fuels that are not already cogenerating electricity. For consistency with the goal of reducing overall emissions, any program designed around CHP would need to define the allowable emission limits and might also specify allowable fuels for program eligibility. To promote CHP in New Hampshire, a Combined Heat & Power Resource Standard (CHPRS) could be enacted that would provide emissions reductions and energy price reduction benefits. Similar to a Renewable Portfolio Standard for renewable power, certificates could be awarded to both renewable and non-renewable CHP project developers/owners; and electric utilities could be mandated to meet a percentage of their portfolio by buying CHP certificates. Because CHPRS annual requirements are cumulative, savings would steadily mount. If a CHPRS calls for 0.75 percent savings per year, after a two-year ramp-up period, by 2020 annual electricity from the grid would be reduced by nearly 10 percent.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): A CHPRS is a simple, market-based mechanism to encourage more efficient electrical generation and the use of waste heat produced during generation. On-site generation of electricity reduces or eliminates electrical transmission needs, and any excess electricity produced by CHP can be delivered into the grid. A CHPRS consists of electric energy savings targets for utilities, often with flexibility to achieve the target through a market-based trading system. Sometimes distribution system efficiency improvements and other high-efficiency distributed generation systems are included as well. CHPRSs are typically implemented at the state level. With trading, a utility that saves more than its target can sell energy savings credits to utilities that fall short of their savings targets. Trading would also permit the market to find the lowest-cost energy savings. Enactment of a CHPRS in New Hampshire would promote energy-saving opportunities available in-state and reduce dependence on other resources such as fossil fuels. Studies in many states have found cost-effective opportunities to reduce energy use by 20 percent or more.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)
   a. *Method of Establishment (e.g., legislation, executive order):* The 2006 Laws of New Hampshire, Chapter 257, approved May 25, 2006, and the 2007 Laws of New Hampshire, Chapter 364, approved July 17, 2007 established and expanded the State Energy Policy Commission and charged it with the duty to study the adequacy of electricity supplies to meet demand. The Commission was directed to report its findings and any recommendations for legislation in the form of a final report by December 1, 2008. A CHPRS could be submitted to the Commission for review and consideration.
   b. *Resources Required:* The PUC is already in the process of implementing a Renewable Portfolio Standard (RPS). If enacted, a CHPRS could easily be added separately.
   c. *Barriers to Address:* Eligibility requirements/emission limits need to be defined so that CHPRS achieves actual emission reductions.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)
   a. *Parties Responsible for Implementation*: PUC and the regulated electric and natural gas utilities.
   b. *Parties Paying for Implementation*: Ratepayers
   c. *Parties Benefiting from Implementation*: Utilities and all citizens.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): Today, New Hampshire has utility-administered energy efficiency programs funded by ratepayers through the System Benefits Charge (SBC) on electric bills and through a charge included in gas rates.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)

    a. *Existing*: Renewable Portfolio Standard (RPS)

    b. *Proposed*

        i. EGU Action 2.2 – Regional Greenhouse Gas Initiative (RGGI).

        ii. Other policies proposed by the EGU working group and the RCI working group.

        iii. SB451, legislation that would provide a framework for utility investments in distributed energy resources including energy efficiency.

6. Timeframe for Implementation: Enactment could be as early as 2009 with implementation in 2010.

7. Anticipated Timeframe of Outcome: 2010 – 2025.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions

    a. Short-term (2012): 0.15 MMTCO2e/year
    b. Mid-term (2025): 0.53 MMTCO2e/year
    c. Long-term (2050): 0.69 MMTCO2e/year

2. Economic Effects

    a. Costs

        i. Implementation Cost: Moderately high
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Evenly distributed

    b. Savings

        i. Potential Economic Benefits: High
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Business – evenly distributed

3. Other Benefits/Impacts

    a. *Environmental*: Improvements in energy efficiency will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

    b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

    c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce “green” jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)

    a. *Technical*: A CHPRS can be implemented relatively easily once the Energy Policy Commission determines appropriate policies.

    b. *Economic*: A CHPRS will have a positive impact.

    c. *Statutory/Regulatory:* High potential as an RPS is already being implemented.

    d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note: Energy reductions resulting from CHP should not be double-counted as reductions associated with implementation of RGGI.

6. Level of Group Interest:

7. References:

- U.S. Clean Heat & Power Association, http://www.uschpa.org/.
- American Council for an Energy-Efficient Economy, "Energy Efficiency and Resource Standards: Experience and Recommendations," http://www.aceee.org/pubs/e063.htm.
- NH Public Utilities Commission, Energy Policy Commission Interim Report 2007 (12/1/07), http://www.puc.state.nh.us/Electric/electric.htm.
- Connecticut Department of Public Utility Control, http://ct.gov/dpuc/.
- New England Power Pool (NEPOOL) Generation Information System, www.nepoolgis.com.

EGU Action 2.1 – Renewable Portfolio Standard (RPS)

Summary

Implement the Renewable Portfolio Standard enacted in 2007 that mandates that 23.8 percent of the retail sales to in-state customers will be met by renewable energy sources by 2025.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): The RPS program requires retail electricity providers (a.k.a. distribution utilities or load-serving entities) to acquire renewable energy certificates (RECs), each representing one MWh and tracked by ISO-NE, in sufficient amounts to meet specified percentages of their energy portfolios. NH RPS requirements call for the following amounts of generation by 2025:
    - New solar 44,000 MWh (0.3%);
    - New other (defined as wind; geothermal; ocean thermal; wave, current or tidal energy; hydrogen derived from biomass fuels or methane gas; eligible biomass or methane gas; the equivalent displacement of electricity by end-use customers from solar hot water heating systems used instead of electric hot water heating; additional new solar; or incremental new eligible biomass, methane gas, or hydro) 2,340,000 MWh (16%);
    - Existing eligible small (<25MW) biomass & landfill methane 950,733 MWh (6.5%); and
    - Existing small (<5MW) hydro 146,267 MWh (1%).

    New Hampshire RPS demand combined with regional RPS demand is modeled to lead to new in-state development of 960 MW wind, 56 MW biomass, 15 MW landfill gas, and 33 MW solar by 2025. There is sufficient potential generation supply to meet the 22 million MWh of projected regional RPS demand for new renewable energy generation by 2025. In New Hampshire alone, the potential developable total renewable capacity and generation are 4,447 MW and 12,819,000 MWh by 2025.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)
    a. *Method of Establishment (e.g., legislation, executive order)*: Interim rule is in place; PUC will complete final rulemaking.
    b. *Resources Required*:
    c. *Barriers to Address*:

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)
    a. *Parties Responsible for Implementation*: PUC and electric utilities.
    b. *Parties Paying for Implementation*: Ratepayers.
    c. *Parties Benefiting from Implementation*: Utilities; all citizens.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): Today, New Hampshire has utility-administered energy efficiency programs funded by ratepayers through the System Benefits Charge (SBC) on electric bills and through a charge included in gas rates.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)
    a. *Existing*:
    b. *Proposed*: EGU Action 2.2 – Regional Greenhouse Gas Initiative (RGGI).

6. Timeframe for Implementation: 2008 – 2025.

7. Anticipated Timeframe of Outcome: 2008 – 2025.

Program Evaluation

1. Estimated CO_2 Emission Reduction
   a. Short-term (2012): 0.28 MMTCO2e/year
   b. Mid-term (2025): 1.40 MMTCO2e/year
   c. Long-term (2050): 1.81 MMTCO2e/year

2. Economic Effects
   a. Costs
      i. Implementation Cost: Moderately low
      ii. Timing: Constant / even
      iii. Impacts: Evenly distributed
   b. Savings
      i. Potential Economic Benefits: Moderate
      ii. Timing: Low short-term / mostly long-term
      iii. Impacts: Evenly distributed

3. Other Benefits/Impacts
   a. *Environmental*: This action will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.
   b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.
   c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce “green” jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.
   d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)
   a. *Technical*: There is an immediate potential for implementing this action as the technology is available and the demand exists.
   b. *Economic*: This action has high potential, as noted in the UNH report “Economic Impact of a New Hampshire Renewable Portfolio Standard.”
   c. *Statutory/Regulatory*: The existing statute is in place and regulations are under development

d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note

   a. The reductions are a portion of the reductions associated with implementation of RGGI and should not be double-counted.

   b. The current marginal CO2 emission rate reported by ISO-NE is 1,100 lb/MWh.

6. Level of Group Interest: High

7. References:

- UNH report "Economic Impact of a New Hampshire Renewable Portfolio Standard," http://www.des.state.nh.us/ard/climatechange/rps.htm

- NHPUC, Energy Policy Commission Interim Report 2007 (12/1/07), http://www.puc.state.nh.us/Electric/electric.htm

EGU Action 2.2 – Regional Greenhouse Gas Initiative (RGGI)

Summary

Implement the Regional Greenhouse Gas Initiative, beginning in 2009, to stabilize carbon dioxide emissions (CO2) emissions from power plants at 188,076,976 tons (regional 3-year average) through 2014. Reduce CO2 emissions by an additional 2.5 percent per year for 4 years (10 percent total) through 2018. In 2012, evaluate the feasibility of further reductions after 2018.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): The policy reduces carbon dioxide emissions by means of a "cap-and-trade" program. The cap sets the maximum amount of emissions that can be emitted in aggregate from all regulated sources in the region. It does not put any limits on emissions for individual units. Instead, allowances are created that each represent one ton of carbon dioxide emissions. Emission allowances are marketable commodities that can be purchased, sold, or banked (held for future use). Each quarter, a number of allowances will be auctioned. Regulated sources need to obtain enough allowances to cover the amount of carbon dioxide they emit by the end of each 3-year compliance period. A cap-and-trade program draws on the power of the marketplace by not prescribing specific mechanisms for regulated sources to manage their carbon emissions. Regulated sources can design their own compliance strategies to obtain all of the emission allowances they require using the lowest-cost approach. Revenues from the auctioning of allowances can be invested in additional energy efficiency that further reduces emissions and saves money over time.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)
   a. *Method of Establishment (e.g., legislation, executive order)*: Legislation, followed by rulemaking.
   b. *Resources Required*: Self-funded by auction revenues.
   c. *Barriers to Address (especially for medium to low feasibility actions)*:

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)
   a. *Parties Responsible for Implementation*: New Hampshire Legislature, NHDES, NHPUC, RGGI Inc[2].
   b. *Parties Paying for Implementation*: Current ratepayers.
   c. *Parties Benefiting from Implementation*: Future ratepayers, the entire state, and neighboring states.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): RPS; Systems Benefit Charge CORE energy efficiency program.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)
   a. *Existing*:
   b. *Proposed*: Action 1.2 – Energy Efficiency Procurement and other energy efficiency programs.

6. Timeframe for Implementation: 2009 - 2018.

7. Anticipated Timeframe of Outcome: 2009 - 2018.

[2] RGGI, Inc. is a new non-profit corporation intended to provide a forum for collective policy deliberation by RGGI Signatory States and to support individual action by the member States in matters related to implementation of the RGGI program. A primary role for RGGI, Inc. will be the provision of technical and administrative support services to the member States in implementing the RGGI program.

Program Evaluation

1. Estimated CO_2 Emission Reductions/Avoided Increases:

    a. Short-term (2012): 0.42 MMTCO2e/year
    b. Mid-term (2025): 2.74 MMTCO2e/year
    c. Long-term (2050): 5.87 MMTCO2e/year

2. Economic Effects

    a. Costs

        i. Implementation Cost: Moderate
        ii. Timing: Constant / even
        iii. Impacts: Evenly distributed

    b. Savings

        i. Potential Economic Benefits: Moderately high
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Evenly distributed

3. Other Impacts

    a. *Environmental*: This action will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

    b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

    c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce “green” jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

    d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*): High

    a. *Technical*: The technologies required already exist.

    b. *Economic*: This is a self-funded program that will cost the state more if it were not to participate in the regional effort to reduce greenhouse gas emissions.

    c. *Statutory/Regulatory*: There are low statutory and regulatory barriers remaining as the legislation in support of this policy passed in June 2008.

    d. *Social:* Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Level of Group Interest:

6. Other Factors of Note:

7. References:

- Ross Gittell, Ph.D. & Matt Magnusson, MBA, “Economic Impact in New Hampshire of the Regional Greenhouse Gas Initiative (RGGI): An Independent Assessment,” University of New Hampshire Whittemore School of Business and Economics, January 2008.

EGU Action 2.3 – New Source Performance Standard (NSPS)

Summary

In addition to RGGI, a New Source Performance Standard (NSPS) for CO_2 could be developed and applied to all ***new*** power plants in New Hampshire above a specific size threshold. The NSPS would be an output-based emission standard (emission limit) that is fuel-neutral; i.e., it would apply equally to any qualifying facility burning any type of fuel. The EGU working group requested a sensitivity analysis from its consultant CSNE of potential emissions reductions and costs for two optional applicability thresholds: facilities larger than 10 MW and facilities larger than 30 MW. Similarly, the group requested analysis of a range of optional emission levels from 250 to 1,100 lb/MWh for the proposed standard. The lower value would be achievable by applying carbon capture and sequestration (CCS) to new integrated gasification combined cycle (IGCC) coal plants at an 87.5 percent control level from an assumed uncontrolled CO_2 emission rate of 2,000 lb/MWh. CSNE explained that the proposed applicability thresholds are essentially the same because all new fossil fuel-fired plants are likely to exceed 30 MW. CSNE also noted that CO_2 emission rates for new natural-gas-fired plants are typically around 800 lb/MWh and that the higher rate of 1,100 lb/MWh was already analyzed as being representative of business-as-usual. Significant avoided emissions could be achieved by implementing NSPS at emission rates between 250 and 1,100 lb/MWh.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): This policy complements RGGI by reducing CO_2 emissions growth from new power plants by imposing an emission performance standard for this energy sector. Accordingly, the resulting CO_2 emission levels would be below business-as-usual (BAU) emission levels. The New Source Performance Standard determines the maximum rate of emissions that can be emitted from individual new units. Implementation of this policy would effectively ban new near-term coal generation because there are neither cost-effective control technologies nor infrastructure currently available to achieve the proposed emission rate limits (carbon capture and sequestration would be required). Because new plants would most probably be located in states having higher population density and greater electric demand, implementation of an NSPS for CO_2 emissions may be more a regional or national issue than an issue for New Hampshire alone. Absent actions on a broader scale, New Hampshire will need to decide whether to be a leader by taking steps toward implementing an NSPS policy at the state level.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)
   a. *Method of Establishment (e.g., legislation, executive order)*: Legislation, followed by rulemaking.
   b. *Resources Required*:
   c. *Barriers to Address (especially for medium to low feasibility actions)*: There may be technological barriers and excessively high costs that prevent attainment of the lowest desirable CO_2 emission rate for new power plants.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)
   a. *Parties Responsible for Implementation*: NH Legislature, NHDES
   b. *Parties Paying for Implementation*: New generation facility owners.
   c. *Parties Benefiting from Implementation*: The entire state and neighboring states.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*):

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)
   a. *Existing*:
   b. *Proposed*: Action 2.2 – Regional Greenhouse Gas Initiative (RGGI).

6. Timeframe for Implementation: 2010+

7. Anticipated Timeframe of Outcome: 2010+

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

NSPS	CO_2 Emission Reductions		
	2012	2025	2050
250 lbsCO2/MWh	0.28	1.44	3.68
300 lbsCO2/MWh	0.26	1.33	3.39
400 lbsCO2/MWh	0.21	1.10	2.80
500 lbsCO2/MWh	0.17	0.87	2.22
600 lbsCO2/MWh	0.12	0.64	1.63
700 lbsCO2/MWh	0.08	0.41	1.04
800 lbsCO2/MWh	0.03	0.18	0.46

2. Economic Effects
   a. Costs
      i. Implementation Cost: Moderately high for all scenarios
      ii. Timing: Low short-term / mostly long-term for all scenarios
      iii. Impacts: Evenly distributed for all scenarios
   b. Savings
      i. Potential Economic Benefits: Low for all scenarios
      ii. Timing: Low short-term / mostly long-term for all scenarios

3. Other Benefits/Impacts
   a. *Environmental*: The proposed action will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.
   b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.
   c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce “green” jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.
   d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*): High

   a. *Technical*: Technology is currently in the demonstration stage for carbon capture and sequestration, which may be necessary in order for higher carbon fuels to be utilized with a NSPS.

   b. *Economic*: The implementation costs will rise as the NSPS limit is reduced.

   c. *Statutory/Regulatory*: A legislative process would be required, followed by a rule making process in order to implement a NSPS. This could be implemented as a complementary mechanism to the Regional Greenhouse Gas Initiative (RGGI) as means to expand generation while staying under the emissions cap.

   d. *Social*: While there may be economic barriers to short-term implementation, over the long-term carbon capture and sequestration technology could enable the country to utilize its coal reserves and increase energy security.

5. Level of Group Interest:

6. Other Factors of Note:

7. References:

- Pew Center papers:
  - State Options for Low-Carbon Coal Policy, Coal Initiative Reports - White Paper Series, Pew Center on Global Climate Change (www.pewclimate.org) p. 61.
  - A Program to Accelerate the Deployment of CO2 Capture and Storage (CCS): Rationale, Objectives, and Costs**,** Coal Initiative Reports - White Paper Series, Pew Center on Global Climate Change (www.pewclimate.org) p. 54.
- Federal bills:
  - S.1201, "A bill to amend the Clean Air Act to reduce emissions from electric powerplants, and for other purposes," Sec. 712, Low-Carbon Generation Requirement.
- Washington State Chapter 80.80 RCW, *Greenhouse gases emissions – baseload electric generation performance standard*, http://apps.leg.wa.gov/RCW/default.aspx?cite=80.80&full=true

EGU Action 2.4 – Low- and Non-CO_2-Emitting Supply-Side Resources

Summary

Society needs to move away from carbon-based supply-side resources (i.e., fossil-fuel-fired power plants) toward electrical generating facilities that are low- or non-CO2-emitting. The State of New Hampshire should serve as facilitator in the development of these new facilities. Essential to achieving this goal is the removal of existing obstacles to energy facility siting and transmission infrastructure in the state. New Hampshire's planning efforts cannot stand in isolation and should be coordinated with other states and Canada.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*): Although significant and increasing resources will be deployed to reduce electrical demand through greater energy efficiency and clean distributed generation, existing supply-side resources will continue to be needed as New Hampshire makes the transition to a low-carbon future. The overall strategic plan must also anticipate load growth by enabling the construction of clean, new generating facilities.

   There is a critical need to meet demand and replace older facilities with newly constructed central-station plants that are large (200 + MW), medium (50-200 MW) and small (less than 50 MW) generating facilities. Furthermore, it is reasonable to assume that certain carbon-based fuels will become less readily available in the future and that energy prices will increase. An important component of a core strategy to manage future energy supply and cost structure is diversification of the supply mix. Building low- and non-carbon emitting generating facilities over the next 5 to 10 years would help New Hampshire meet the inevitable and growing demand for carbon-free energy and would assist in stabilizing and containing future energy prices. The primary technologies under consideration are hydro, solar photovoltaic, wind, geothermal, tidal and biomass.

   While addressing supply needs, it is imperative that electrical transmission capability within the state also be enhanced and increased to support the development of new low- or non- CO2-emitting generation facilities. Consequently, the state should evaluate existing barriers to both facility siting and electrical transmission and should develop solutions to overcome any obstacles or deficiencies in the shortest possible time frame. Workable solutions would involve coordinated planning with neighboring states and Canada.

   Note: Because end-user, demand-side generation is addressed in other actions proposed by the EGU working group and the RCI working group, the action proposed here is not intended to include generation deployed at end-user locations to reduce consumption (e.g., solar panels and other demand-side technologies installed at industrial or residential sites).

2. Implementation Plan (*i.e., how to implement the specific policy or program*)
   a. *Method of Establishment (e.g., legislation, executive order)*
      i. Seek methods to influence ISO-NE to expedite interconnection application review and approval for these types of facilities.
      ii. Establish streamlined state and local permitting processes. Consider an expedited process for smaller generation facilities using renewable resources.
   b. *Resources Required*: ISO-NE, state government, PUC, NHDES, and local governing bodies must align support of such applications.
   c. *Barriers to Address*: Eliminate barriers for construction of new, clean generation.
      i. Address transmission infrastructure limitations, including the Coos County loop in northern New Hampshire
      ii. Address obstacles to speedy and efficient project review at the state and local levels.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc.*)

    a. *Parties Responsible for Implementation*: State legislature, NHDES, PUC, New Hampshire Site Evaluation Committee, and regulated utilities.

    b. *Parties Paying for Implementation*: Ratepayers in New Hampshire and potentially throughout New England would pay for enhanced transmission; company shareholders would pay for costs to construct new generation facilities.

    c. *Parties Benefiting from Implementation*: All citizens would benefit from reduced CO_2 emissions.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*):

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)

    a. Encourage expanded sourcing of electrical supply contracts from low- or non-CO_2-emitting generating facilities to displace current CO_2-emitting resources and to meet new demand. Specifically, policies should be put in place to increase supplies from carbon-free sources (see EGU Action 2.4 – Low- and Non-CO_2-Emitting Supply-Side Resources).

    b. Enable the development of transmission resources in northern New Hampshire to facilitate renewable power transfers to southern New Hampshire. Also, transmission facilities should be installed to allow clean energy purchases. (See Senate Bill 383.)

    c. Allow the deployment and installation of clean, small-scale distributed energy and heat producing generating facilities. (See Senate Bill 451.)

    d. Evaluate the retention of existing nuclear power generation facilities into the future. This form of generation is considered in detail as a separate item (see EGU Action 2.5 – Nuclear Power Capacity).

6. Timeframe for Implementation: Begin in 2008 by passing appropriate legislation to provide an expedited facility siting review/approval process and to address existing electrical transmission limitations in New Hampshire.

7. Anticipated Timeframe of Outcome: Complete development of an expedited facility siting process and resolve existing transmission issues in 2009. Consider pending plans to construct facilities to meet on-line availability dates in the period from 2014 to 2020. These actions will be necessary if New Hampshire is to achieve the stated goal of a 25-percent reduction in carbon emissions by 2025.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions: This action is not individually quantified for potential emission reductions. Significant reductions could be achieved by:

    - Importing more power from Canada
    - Importing more power from Maine (1,000 MW new wind energy is planned)

2. Economic Effects

    Note: Value analysis of electric rate change versus environmental benefit must be weighed for each program or project considered.

    a. Costs

i.	Implementation Cost:	Low
ii.	Timing:	Constant / even
iii.	Impacts:	State government (due to administrative costs)

    b. Savings: Not directly quantifiable; proposed action is a supporting mechanism.

3. Other Benefits/Impacts:

    a. *Environmental*: The proposed action will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

    b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

    c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce "green" jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

    d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)

    a. *Technical*: Pending plans to construct facilities can be implemented relatively easily once siting and transmission policy issues are addressed.

    b. *Economic*: New facilities will create many construction jobs, long-term employment and tax revenue which will have a positive impact on the state's economy and will avoid fuel expenses being paid to other states and countries.

    c. *Statutory/Regulatory*: The Legislature and Commission has the authority to approve most needed changes. If NH attempts to socialize the costs of transmission improvements across New England, the ISO and/or FERC will need to be involved.

    d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note:

6. Level of Group Interest:

7. References:

EGU Action 2.5 – Nuclear Power Capacity

<u>Summary</u>

Nuclear power generation accounts for 20 percent of the total electricity generated in the United States and 45 percent of the total electricity generated in New Hampshire. FPL Energy Seabrook Station is New England's largest single-unit power plant and generates enough power to serve more than a million homes and businesses in the region. Seabrook Station's current operating license expires in 2030, and the company plans to file for a 20-year license renewal. *Continued operation of Seabrook Station was assumed by CSNE in the business-as-usual baseline scenario.*

There are current plans to build more than 30 new nuclear plants in the United States, but most will be located in the South. Under the constraints of permitting and construction timelines, the first unit is not expected to go on line until 2015. Many believe that the Northeast is an unlikely spot for siting new nuclear plants because of the history of opposition to such plans.

<u>Program Description</u>

1. Mechanism (*i.e., how the policy or program achieves the desired result*): No company has announced plans to build a new nuclear power plant in New Hampshire. Opponents contend that nuclear generation should be measured against renewable generation or energy efficiency in terms of costs, environmental impacts, and life-cycle emissions; they reason that greater emissions reductions could be achieved with renewable generation and energy efficiency instead of new nuclear capacity. Proponents point out that the magnitude of renewable generation and energy efficiency that would be needed to achieve CO2 emission reduction targets may be unrealistic. (For comparison, Seabrook Station has a capacity of 1,200-MW, while PSNH's Northern Wood Power Project is rated at 50 MW.) Because the federal Nuclear Regulatory Commission has jurisdiction over re-licensing, there is no state-level action item associated with maintaining existing nuclear generation.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)

   a. *Method of Establishment (e.g., legislation, executive order)*

      The state Energy Facility Site Evaluation Committee performs review for new project siting only, not re-licensing. The federal Nuclear Regulatory Commission reviews applications for both re-licensing and new facilities.

   b. *Resources Required*

      The initial high-cost capital investment to build Seabrook Station has already been made. Once built, nuclear plants like Seabrook are relatively low-cost to operate; but those operating costs do not account for the recurring long-term costs of spent fuel storage and disposal. The August 2, 2007, ISO-NE *New England Electricity Scenario Analysis* states the following assumptions:

      - Capital costs for new nuclear plant capacity range from $3,000/kW to $5,000/kW (compared to $800 to $1,000/kW for natural-gas-fired plants)
      - Annual production costs for nuclear plants are $5,502 million (compared to $6,825 million for natural-gas-fired plants)

   c. *Barriers to Address (especially for medium to low feasibility actions)*

      The lack of a long-term repository for spent fuel is a major obstacle to nuclear power development.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.):

   a. *Parties Responsible for Implementation*: Energy Facility Site Evaluation Committee (for new siting only, not re-licensing), federal Nuclear Regulatory Commission, PUC, ISO-NE, FEMA

   b. *Parties Paying for Implementation*: When New Hampshire restructured the utility industry, Seabrook Station was sold and thus transitioned from a regulated power plant to an independent generator. The costs for producing power are borne by the shareholders and recovered from electricity customers through the regional pricing of electricity.

c. *Parties Benefiting from Implementation*: Florida Power and Light and citizens in the region who purchase electricity from the plant.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): ISO-NE regional planning

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*):

   a. *Existing*:

   b. *Proposed*: EGU Action 2.2 – Regional Greenhouse Gas Initiative (RGGI): Placing a price on carbon dioxide emissions could provide an advantage to nuclear generation. If a more stringent post-2018 phase of RGGI were established, this advantage would increase.

6. Timeframe for Implementation: 2025

7. Anticipated Timeframe of Outcome: 2025 and thereafter

<u>Program Evaluation</u>:

Three different scenarios were evaluated in order to understand the implications of nuclear energy's potential contribution to the NH generation mix in terms of CO_2 reductions and cost.

- Nuclear Case 1: Replace nuclear capacity with natural gas in 2030
- Nuclear Case 2: Business as usual (renew license and maintain capacity)
- Nuclear Case 3: Replace petroleum, coal, and a portion of natural gas base generation with new 1000 MW nuclear power plant

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$/year)

Scenario	**CO_2 Emission Reductions**		
	2012	**2025**	**2050**
Nuclear Case 1: Replace nuclear capacity with natural gas in 2030	0.00	0.00	-4.05
Nuclear Case 2: Business as usual (renew license and maintain capacity)	0.00	0.00	0.00
Nuclear Case 3: Replace petroleum, coal, and a portion of natural gas base generation with new 1000 MW nuclear power plant	0.00	6.23	6.23

2. Economic Effects (see 2.b under Program Description, above, and references below)

   a. Costs

Scenario	**Implementation Cost**	**Timing**	**Impacts**
Nuclear Case 1: Replace nuclear capacity with natural gas in 2030	High	Low short-term / mostly long-term	Evenly distributed
Nuclear Case 3: Replace petroleum, coal, and a portion of natural gas base generation with new 1000 MW nuclear power plant	Very high	Low short-term / mostly long-term	Evenly distributed

b. Savings

Scenario	Potential Economic Benefit	Timing	Impacts
Nuclear Case 1: Replace nuclear capacity with natural gas in 2030	Low	Low short-term / mostly long-term	Evenly distributed
Nuclear Case 3: Replace petroleum, coal and a portion of natural gas base generation with new 1000MW nuclear	Low	Low short-term / mostly long-term	Evenly distributed

3. Other Impacts

   a. *Environmental*: Seabrook is on the seacoast and subject to potential flooding from long-term sea level rise. On-site spent fuel storage could potentially result in contamination if extreme flooding were to occur. On-site spent fuel storage could be significantly reduced if a national storage facility is approved. Federal action on storage could occur prior to Seabrook's re-licensing date but is not assured. Therefore, the possibility of preventive measures (e.g., seawall construction) should be considered by the Adaptation working group. In the meantime, more than half the country's nuclear power plants store their own waste on-site. It is a mature technology with a substantial safety design. Seabrook Station will begin dry fuel storage in the summer of 2008. With respect to emergency preparedness, nuclear power plants are built with reasonable assumptions regarding physical threats and natural disasters, including extreme weather events. Seabrook Station's safety-related openings are located above what is called the reachable maximum precipitation level. This level was determined by analysis of extreme storm conditions that assumed the highest water mark in a 100-year period in combination with simultaneous worst-case rain and storm surge events.

   b. *Health*: Nuclear plants have risks of radiation exposure from accidents or major catastrophes (e.g., terrorist attacks, equipment malfunctions, etc.). Seabrook Station has redundant safety measures in place intended to minimize the probability of such occurrences. These include a redundant safety system design, highly-trained employees, and a comprehensive emergency plan managed by New Hampshire and Massachusetts.

   c. *Social*: The existing facility is a major employer in the region.

   d. *Other*:

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)

   a. *Technical*: There is the potential for implementing this action at any time because nuclear power technology is fully developed and available.

   b. *Economic*: Although there may be significant long-term economic advantages to avoided CO2 emissions associated with ***new*** nuclear generation, this technology has high up-front capital costs and the uncertain costs of long-term nuclear waste disposal.

   c. *Statutory/Regulatory*: The state has no authority over permitting nuclear facilities but may have a role in influencing federal decisions to approve or deny nuclear plant licenses.

   d. *Social*: The probability of significant public opposition makes the implementation potential of new nuclear capacity low.

5. Level of Group Interest: The EGU working group members generally agree that building new nuclear generation in New Hampshire is a secondary, long-term consideration that does not need to be evaluated at this time. However, most working group members agree with continued reliance on existing nuclear generation capacity for the near term or beyond. Some Task Force members have expressed an interest in evaluating the potential

long-term avoided CO_2 emissions that could result from building new nuclear capacity. Although ***new*** nuclear generation could provide significant long-term avoided CO_2 emissions, many working group members have concerns about the high initial capital outlay for new nuclear generation and the ongoing issue of nuclear waste disposal.

6. References:

- Nuclear Information and Resource Service, http://www.nirs.org/.
- Fosters Daily Democrat news article, "License extension in offing for Seabrook Station," October 14, 2007, http://www.fosters.com/apps/pbcs.dll/article?AID=/20071014/GJNEWS_01/710140075&SearchID=73319232746974.
- The Rocky Mountain Institute, http://www.rmi.org/sitepages/pid257.php.
- USEC Inc., supplier of enriched uranium fuel for commercial nuclear power plants, http://www.usec.com/.
- Photo essay on fossil fuel use in the nuclear fuel cycle, http://www.peakoil.org.au/nuclear.co2.htm.
- Jan Willem Storm van Leeuwen and Philip Smith, Nuclear power – the energy balance**,** February 2008, http://www.stormsmith.nl/.
- Arjun Makhijani, President of the Institute for Energy and Environmental Research in Takoma Park, MD, "Carbon-Free and Nuclear-Free: A Roadmap for US Energy Policy," 2007 RDR Books, Muskegon, MI (downloadable from his website, www.ieer.org).
- Uwe R. Fritsche, Coordinator Energy & Climate Division, Öko-Institut, Darmstadt Office, "Comparison of Greenhouse-Gas Emissions and Abatement Cost of Nuclear and Alternative Energy Options from a Life-Cycle Perspective."
- Section 6.4.2 *"Premature Closure of Seabrook"* New Hampshire Energy Plan November 2002 NH OEP: "The closure of Seabrook nuclear station in 2005 would lead to some rather significant consequences for the New Hampshire and the New England regional energy system. The Seabrook shutdown is forecast to cause retail electricity prices to rise by as much as 10% relative to the Base Case. As in the hypothetical coal closure scenario, this leads to modest near-term economic impacts, with longer-term economic gains as a result of efficiency improvements. However, with the higher price impact of Seabrook closure, it takes longer (more than 10 years) for the economic impacts to turn positive. In contrast to the coal hypothetical, the closure of Seabrook would cause a major increase in greenhouse gas emissions, as fossil fuels (largely natural gas) would likely replace the lost nuclear generation."
- American Nuclear Society position statements, http://www.ans.org/pi/matters/nextgen/.
- U.S. Dept. of Energy, http://www.ne.doe.gov/.
- Environmental Science & Technology article, "What History Can Teach Us About the Future Costs of U.S. Nuclear Power," http://pubs.acs.org/subscribe/journals/esthag/41/i07/html/040107viewpoint_hultman.html.
- U.S. House Committee on Science & Technology, July 12 , 2005, Subcommittee on Energy hearing, Economic Aspects of Nuclear Fuel Reprocessing
http://gop.science.house.gov/hearings/energy05/july%2012/.
Supplemental Materials
University of Chicago Study: The Economic Future of Nuclear Power. (pdf)
The Economics of Reprocessing Versus Direct Disposal of Spent Nuclear Fuel. (pdf)
MIT Study: The Future of Nuclear Power. (pdf)
- Comments on MIT study, http://www.rmi.org/images/PDFs/Energy/E04-22_FutureNucPwr.pdf.